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Shale gas governance in the United Kingdom and the United States: Opportunities for public participation and the implications for social justice

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ABSTRACT

Questions abound about the appropriate governance systems to manage the risks of unconventional oil and gas development, and the ability for citizens to engage and participate in those systems. In this paper, we map the development of shale gas governance in the US and UK; we highlight the contrasting systems of land ownership and mineral rights, compare the opportunities that these systems of governance present the general public to participate and become involved in shale gas decisions and consider the implications on issues of social justice.

We conclude that in both countries, that despite government and industry engagement rhetoric and associated processes, the publics' influence on shale gas decisions is perceived to be minimal or not at all. We argue that the implications of the observed institutional governance systems, with few opportunities for citizen influence, are developments which inherently lack social justice, procedural fairness, and ultimately, a social license to operate.

1. Introduction

Shale gas energy policy and exploration in the UK is an area of emerging interest, for both academic researchers and policy makers. Scholars have asserted that despite the significance of technological considerations and challenges, the process of extraction and utilising unconventional oil and gas is not simply a technological issue [1]. Questions abound, however, about the appropriate governance systems to manage the risks of unconventional oil and gas development and the ability for citizens to engage and participate in those systems [2]. In the context of shale gas development and its associated, multidisciplinary risks, governance has been posited as "the most critical domain" to facilitate changes and improve the management of these risks [3]. Governance is a complex, multifarious notion. Sovacool and Cooper [4] refer to three interrelated meanings of governance, in the context of energy megaprojects:

1. Governance can refer to the internal operation and management of the megaproject itself, e.g. how well it is built and maintained.
2. Governance can refer to the economics and politics of the system, e.g. the coalitions of interest involved in supporting or opposing a megaproject.
3. Governance can refer to the interaction between the technology of a megaproject and the types of social organisation it creates, e.g. whether it is controlling or democratic.

We focus on the third of these and consider governance in the context of public participation and social justice, contributing to the evolving research on energy justice [4–7]. Evaluating where injustices occur within this context and what processes exist to remedy these [8] would seem a sensible definition of our approach to understanding energy justice. We consider how energy systems can or should be governed in a way that contributes towards a fair and just society through a US/UK comparison of shale gas developments.

The US shale energy industry is well-established, and has largely followed the existing procedures in relation to governance and public engagement practices set by the conventional oil and gas industry, with some additional regulatory actions. Fundamentally, the choice to explore and extract in the US setting is based on a private transaction between a landowner and an energy company. Despite some differences in property rights from state to state, the

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contract between the company and the owner of the sub-surface rights governs that transaction (as set out by state law). The rules by which that extraction (and production, transmission, and consumption of the energy source) take place is then governed by a series of federal, regional, state, and local regulations. This complex web makes public participation challenging, as there is no clear pathway for participation nor surety of influence giving rise to grassroots opposition from multiple organizations. The importance of governance systems on project success can be seen in other resource-based industries. Foster and Garduño [9] observe that in groundwater management, it is often not a "lack of knowledge about sustainable yield or pollution vulnerability of aquifers" (p. 317) that are responsible for failures, but inadequate arrangements surrounding governance.

The UK is only now beginning to explore the possibilities of how extensive shale gas reserves, if exploited, could impact on energy prices, job creation and communities. The infancy of the shale gas exploration process in the UK provides a contrast, described as 'puzzling' by Cairney et al. [10], to the 'all out for shale' position of the 2010–2015 Coalition government [11]. Underground mineral resources are owned by the Crown Estate in the UK, and the process of exploring and extracting these resources is governed by a system of national laws. The UK government has established the Office for Unconventional Gas and Oil (OUGO), and are proposing to simplify the planning process for deep drilling of shale gas, oil and geothermal energy sources with the 2014–2015 Infrastructure Bill. This appears to reflect the "significant development support" from the UK government as discussed by Hammond and O'Grady [12]. The authors suggest that this interest in-part is due to the potential 'game changer' benefits for the UK from extracting large quantities of shale gas, which the IEA have suggested could contribute towards a 'Golden Age of Gas' [13].

At the local level, engagement and participation are important to generate what is referred to in the extractive industries as "social license to operate" (SLO) – a social psychological phenomenon of implicit trust relationships to establish *legitimate* extraction activities with mutual industry and community backing [14]. Demuijnck and Fasterling [15] observe that SLO is a critical element of perceived legitimacy, stating that "business enterprises invoke the "social license to operate" (SLO) to indicate that their activities are considered as legitimate in the eyes of society" (p. 675). It is also important for reasons of demonstrating societal support in industrial activities, or in mitigating obstructive opposition; Moffat and Zhang [16] note that SLO relates to "the ongoing acceptance and approval" (p. 61) of extractive developments by local and other stakeholders, and organisations such as the International Energy Agency [13] suggest that a SLO is required by shale gas operators (*in* [17]). We argue that sustainable and legitimate governance systems require long-term support, approval and acceptance from a variety of stakeholders, and that their meaningful participation in decision-making processes is an important part of achieving this.

In this paper, we examine the experiences of shale gas development in the US (broadly, and specifically in Pennsylvania) and the UK (broadly, and specifically in Lancashire). The comparison of these two settings provides insights into the differing governance systems and their potential for public participation. Following a review of the opportunities for participation in each county, we discuss the implications for social and energy justice with reference to our own community-led approach to participation [18]. We argue that this approach can achieve a form of legitimacy that allows communities to derive social priorities by a process of 'community visioning', thereby promoting an active role for members of the public in energy decisions; specifically in the dialogue between government, industry and local communities. We also discuss to what degree we can evidence procedural justice in shale gas decisions that advances a concept of fairness. This comprises two elements; is the process fair, and is the outcome equitable. As Walker [19] notes, justice theory has moved beyond the distributional to emphasise the role of process and procedure. Justice claims often extend beyond the distribution of benefits and cite procedural and regulatory fairness, including the role of stakeholders in decision-making. In recent literature, Cotton [20] asserts that the achievement of fair outcomes, and therefore justice, is dependent on establishing process-based fairness, honesty, accountability and transparency.

2. Development of the shale gas industry in the US and UK

Geologists have known about the reserves contained within "unconventional" sources (low permeability shale and sandstone or coal seams) of natural gas for decades but did not have the technology to extract it economically. In the 1970s, a combination of factors – including industry concerns about declining natural gas production, and federal government concerns about the productivity of domestic energy sources in the wake of the energy crisis – led to a loose coalition of private and public entities that invested in developing the geological knowledge and technological capacity to extract natural gas from unconventional sources [21–23]. Three critical technologies emerged from these investments, and have been crucial to the recent growth in shale gas extraction: three-dimensional micro seismic imaging to map the underground formations; hydraulic fracturing to effectively release the natural gas from the pores in the rock; and horizontal drilling techniques to interface with a larger section of the shale layers. These technologies were proven successful in the Barnett shale in Texas, which was the first formation to move into commercial production in the early 2000s when Mitchell Energy developed an effective "slickwater" that maximized the output of natural gas for the investment in materials in the hydraulic fracturing process.

2.1. ***Development*** *of shale gas industry in US*

In the US, the technique of hydraulic fracturing has been widely employed to extract shale gas from areas such as the Barnett and Marcellus shale basins for over a decade, significantly changing the energy portfolio of the country and natural gas prices. The natural gas industry has grown over 20% in the past 5 years, with 146,000 new producing wells being established during the past 10 years, aided significantly by the expansion of the shale gas industry and the increased use of horizontal drilling and hydraulic fracturing techniques [24]. This has resulted in one of the largest surges in energy production in the country's history [25].

Since the early 2000s, the techniques discussed above were adopted by other production companies, and led, in combination with a rapid rise in the price of natural gas, to the exploration of a series of shale plays across the US between 2003 and 2011 (i.e. Fayetteville, Woodford, Haynesville, Marcellus, and Eagle Ford) and concomitant growth in production. The US Energy Information Administration (EIA) projects that shale-based natural gas production will grow from 0.75 trillion cubic feet per year as recorded in 2005 (4.1% of all gas produced in the US) to 19.8 trillion cubic feet per year in 2040 (53% of all gas produced) [26].

Of the US plays, the Marcellus Shale is the largest in terms of acreage, wells, and production [22]. The first Marcellus well was initially developed in 2003 by Range Resources in Washington County, Pennsylvania [21]. Between 2004 and the end of 2015, 14,022 unconventional wells had been drilled in the Appalachian Basin, including Pennsylvania, Ohio, and West Virginia [27]. The majority of these (9590) had been drilled in Pennsylvania alone [28].

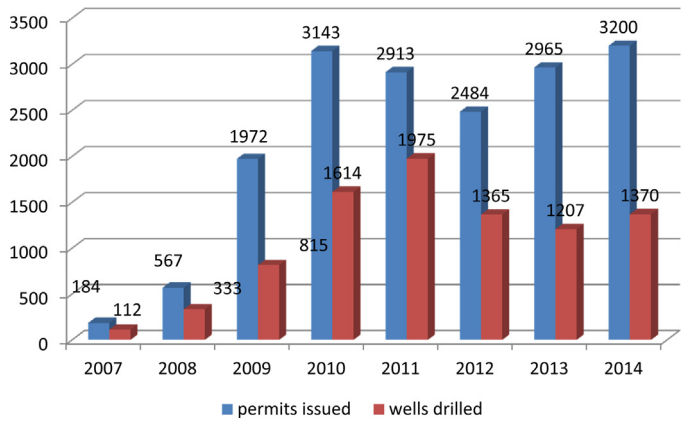

Fig. 1. Permits Issued and Wells Drilled in the US between 2007 and 2014.

In this time, the Appalachian Basin would grow to become the most productive shale gas reserve in the US (accounting for nearly 40% of US shale production) [29], and contributing substantially to recent increases in estimates of natural gas proved reserves (from 186.5 tcf in 2000–388.8 tcf in 2014) [30]. Pennsylvania in particular has seen rapid growth over the past decade (Fig. 1).

This rapid development of unconventional natural gas resources in the Appalachian region has led to many concerns about the potential community, economic, health, and environmental consequences. The academic literature documenting these impacts has, however, been very mixed (see [31] for a summary).

Studies conducted in the US on public perceptions of hydraulic fracturing (e.g. [32]) are valuable in informing similar social research in the UK, and in enabling comparative research between the US and the UK. Despite the establishment of the shale gas industry in the US for many years now, Boudet et al. [32] found public familiarity with hydraulic fracturing to be low, with significant levels of uncertainty in regards to the public's support of shale gas extraction. Stedman et al. [33] concur with Boudet et al. [32] in regards to levels of knowledge of the shale gas industry being found to be relatively low. Public support for shale gas extraction in the US, is higher in states such as Pennsylvania where the industry is established and has been actively extracting shale gas from the Marcellus basin for over a decade [34], and far lower in New York State where until recently there have been extensive environmental and regulatory reviews. Drilling of the Marcellus shale in the state was on hold for a period of time [35], before being rejected and banned by the State Governor in December of 2014 [36].

2.2. ***Development*** *of shale gas in the UK*

The UK Government supports shale gas exploration and extraction, for reasons of energy security, job creation and economic growth [37]. Concurrent to a strong public reaction in the UK to the potential growth of this industry and the utilisation of hydraulic fracturing techniques, there is an emerging body of social science research regarding the UK experience [38].

The situation is the U.K. is different to the US, with a population density of 256 per km^2 [37]. There are also cultural differences between the US and the UK, with lifestyles in the UK being differing in both an international and intranational context. With population density, culture and lifestyle being identified as key factors in the impact of unconventional gas developments [37], the unique societal characteristics of the UK, and indeed the localities in which shale gas developments are sited must be understood in order to manage the impacts of any future UK shale gas developments.

The UK shale gas industry is at an early stage in its development; a number of wells have been drilled but as yet there has been no commercial drilling. As a result, UK-based research has had a geological, geo-engineering and environmental focus, with social science based research only emerging in recent years. Hays et al. [37] state that, whilst remaining aware of the distinct differences between international case studies, countries looking to develop shale gas resources would benefit from reflecting on the experiences of the US. The author highlights the persistent impacts of shale gas developments and short-comings in regulation and research in the US as an important lesson to others:

> *"U.S. experiences do not necessarily make safe shale gas development in the UK or any other part of the world untenable, but the real world impacts that have been observed and the data gaps that persist to date should not be ignored. In particular, declarations of best practices and strong regulation do not guarantee safety, nor apparently do they reassure a significant proportion of public opinion" (p. 37).*

Despite the early stage of shale gas exploration in the UK, events such as the well-publicised seismic tremors early in 2011 [39] – when tremors of magnitudes 2.3 and 1.5 were generated at the same time as drilling company Cuadrilla were operating wells in Weeton, Lancashire – have already brought drilling techniques and the industry in general under intense scrutiny. As a result of these seismic events, the UK Government imposed a moratorium in May 2011 and suspended shale-related drilling activities across the country while an investigation was conducted into the incidents. In December 2012, as a result of the findings of the investigation, these suspensions were removed and exploration drilling was permitted to continue across the UK. During the UK Government Spending Round 2013, the government announced a series of significant proposals to bring about "economic incentivisation at different scales of governance (for onshore oil and gas exploration companies, councils and affected site communities)" ([40]: 1946); these included industry tax breaks, the introduction of a new regulatory framework, reduced business rates for local councils and proposed community benefits packages [41]. Perhaps unsurprisingly, one of the main outcomes from this Spending Round was an increase in applications from exploration companies for Petroleum Exploration and Development Licenses (PEDLs) [40].

Since 2011, public opposition and resistance to the technique, the local implications of exploration, and the motivations of the industry have coalesced into a vocal opposition of the development of this energy industry in the UK, with numerous activist groups forming and protesting against exploratory activities. Uncertainty lies at the heart of this, or as Cairney et al. ([10]: 2) specify, "a dual sense of uncertainty". On this duality, Cotton [40] notes that scientific uncertainty around fracking safety, based on technical information, is one of the key areas which competing framings of shale gas by stakeholder groups aim to manage, with the other identified as decision-making uncertainty, based on political information, surrounding licensing, taxation, mineral rights and planning and regulatory frameworks [10]. As Cairney et al. [10] highlight, uncertainty may be encountered among those attempting to influence the process, due to the following scalar division of responsibility for different aspects of shale gas development:

- European Union – water quality.
- UK Government – mineral rights, licensing, taxation.
- Devolved Governments – planning.
- Local Authorities – permission to pursue drilling at specific sites.

Differences between the regulation and operational governance of shale gas extraction in the US and UK are apparent. Shale gas companies in the UK are obliged, under the Water Resources Act 1991, to disclose the composition of 'fracking fluid', which is pumped down

drilled well bores under pressure to fracture dense shale rock. This is not the case in North America, where companies are permitted to retain the composition of this fluid undisclosed, for reasons of commercial confidentiality [12]. Other differences between the US and the UK cases include the processes for leasing mineral rights and the level of political discourse [42]. Stedman et al. [33] found that despite the greater length of time that shale gas production has been established in the US, knowledge of the shale gas industry is greater in the UK, whilst support is found to be greater in the US. The authors found that knowledge and support are positively correlated in the UK, whilst no such correlation exists in the US. Governance is argued to play a significant role in generating such international distinctions. Stedman et al. [33] demonstrate the validity of the information deficit model of science, with the authors expressing that "concentrated media and governance in the UK" (p. 1) have impacted upon the generation of observed differences. Concurrently, Cotton [40] notes that governance issues have been found to influence stakeholder perceptions of risks and benefits and contribute to observed heterogeneity, including negative leasing and development experiences [43], the insufficiency of consultation measures locally [38,39] and the influence of compensation or funding schemes [44].

Hays et al. [37], examine US shale gas development and discuss the implications and key considerations for the UK. The authors propose that development in the UK should be informed by and built upon *experience* in the form of 'tried and tested' harm reduction strategies including 'social risk', and not on technically-derived scenarios and theorised 'best practice' that are not empirically supported. The authors stress the importance of utilising the experience of the US in UK decision-making, suggesting numerous critical considerations based upon this experience. Regarding such decision making processes, as we have previously proposed, they argue greater transparency and public participation is needed in the UK. Incorporating local stakeholder views into national decision-making and the transparency of the decision-making process continues to be a persistent issue in the UK, a tension we identified previously for other energy scenarios such as the development of new nuclear power stations in the UK [45]. Hays et al. [37] also challenge the UK Government to seriously consider the probable longevity of the shale or unconventional gas developments (UGD) before long-term plans are established, particularly if renewable forms of energy generation demonstrate growing economic viability:

> *"In the end, policymakers and politicians must ask themselves and their constituents whether the more immediate, recognizable gains of UGD are worth the long-term, and in some cases permanent, adverse environmental, climatic, and population health impacts. They should consider how long shale gas development is likely to persist as many other alternative, renewable energy sources become economically viable, and whether as climate change effects become more overt, it will be wise or acceptable to the public to produce shale gas. Ideally, as the U.S. experience has demonstrated, these considerations should come before broad scale extraction."*
> ([37]: 40)

3. Shale gas regulation and ownership in the US and UK

In this section, we compare and contrast the US and UK systems of shale gas governance and identify two critical issues that influence the extent to which the public can become involved in decision making. These are the fragmented nature of unconventional oil and gas regulation in the US compared to the UK, and the private ownership of subsurface rights in the US, when compared to the Government (Crown Estates) owned rights in the UK.

3.1. Unconventional oil and gas regulation and ownership in the US

Unconventional oil and gas development in the US has been governed largely as an extension of the existing framework for conventional oil and gas [22], although with some important updates and additions to that framework. As a result, the opportunities for public engagement with new regulations have been limited to the formal procedures allowed in rulemaking procedures (hearings, comment periods) for new regulations and programs, not the overarching framework. In addition, the sheer complexity and fragmented nature of unconventional oil and gas regulation in the US makes it difficult for a citizen to know how and where to direct their efforts. A number of publications note this complexity, describing a regulatory framework that includes federal, state, local, and regional (e.g., river basin) levels as well as multiple agencies and relevant statutes [22,46] that govern specific components of oil and gas development. Federal authority pertains largely to air and water quality, endangered species, worker safety, hazardous material management, and oversight for specific elements of the process (such as permitting of underground injection wells where states do not have primacy). Federal jurisdiction also applies when the activity is proposed to occur on federally-owned land (such as owned by the Bureau of Land Management or the US Forest Service). River Basin Commissions, which are multi-state bodies created through compacts ratified at the federal and state levels that manage the water resources in their respective watersheds, have regulatory authority over specific activities related to watershed protection (such as water withdrawals in relation to natural gas development). Most activities, however, are governed by the states, with primary responsibility for all components of on-site activities, permitting drilling, hydraulic fracturing, wastewater management, well plugging, and site remediation. The roles of municipal governments vary by state.

Richardson et al. [46] note that in addition to fragmentation across jurisdictions, there is significant heterogeneity between states in their regulatory approaches. They find that this heterogeneity partially reflects differences in degree of development, geology, history, demographics, and economics of the states studied. This heterogeneity further decreases the ability of the public to engage as the regulatory systems and space for public engagement vary between states, as well as between the state level and federal government.

Transparency of regulations and public access to information has been a consistent concern among those critical of unconventional energy development in the US. These concerns have been raised in relation to the contents of hydraulic fracturing fluids; exposure of workers and nearby residents to pollutants, fracturing fluid chemicals, and other materials; and settlements (often related to contamination events) that include nondisclosure agreements. In some states, the regulations themselves are can be difficult to find (and may even be contradictory) within the state's statutes and regulatory codes. The report by NETL [22] also notes that the predominance of case-by-case permitting in many states makes it very difficult to evaluate regulatory effectiveness without gathering and reviewing all permits, stating that "this lack of transparency is identified as a significant barrier for stakeholders, whether they are firms seeking to comply with the law or interested members of the public trying to understand it in light of environmental risks" (p. 55). Some states have sought systems to improve availability of information to the public, such as websites with well information and the encouraged or mandated use of sites like FracFocus (https://fracfocus.org/); the usability of state sites varies significantly across states, with seemingly simple data requests such as well counts difficult to access in some states (e.g. Texas) while others have online GIS and database tools (e.g. West Virginia, Pennsylvania).

Some summaries of regulations of unconventional oil and gas development note that several states have had to update their regulations in response to the rapid development of the industry, often in places with relatively little oil and gas activity historically or with regulations that did not fit the new activity [46]. Some states have experienced complete updating of all their regulatory structures, with others seeking more targeted updates. The impact of the recession on regulatory capacity in each state is not well understood. In addition, anecdotal evidence suggests that regulatory capacity, particularly in some states, was limited because of the loss of experienced regulatory personnel to more lucrative positions in the private oil and gas sector [47,22].

The largely private ownership of subsurface rights means the leasing process is a private transaction between the owners of those subsurface rights and the energy production company. This private transaction (although governed by state law) is a contractual agreement between two parties that does not provide an entry point for public consideration of the proposed activity. Formal public engagement is then limited to their participation in the development and implementation of the regulatory process that governs the subsequent activity. The US shale energy industry is well-established, and has largely followed the existing procedures in relation to governance and public engagement practices set by the conventional oil and gas industry, with some additional regulatory actions. Fundamentally the choice to explore and extract in the US setting is based on a private transaction between a landowner and an energy company. Although there are some differences in property rights from state to state, the contract between the company and the owner of the subsurface rights governs that transaction (as set out by state law). The rules by which that extraction (and production, transmission, and consumption of the energy source) take place is governed by a series of federal, regional, state, and local regulations. This complex web makes public participation challenging, as there is no clear pathway for participation nor surety of influence. However, it has given rise to grassroots opposition from multiple organizations, and the possibility for civil society expansion into areas in which citizens view regulatory systems to be lacking (e.g. monitoring).

3.2. Unconventional oil and gas regulation and ownership in the UK

In contrast to the US, the UK is only now beginning to explore the possibilities of how extensive shale gas reserves, if exploited, could impact on energy prices, job creation and communities. There are currently two main regions of shale gas exploration interest. The first is the Bowland-Hodder gas play running across central England from Cheshire to Yorkshire and the second are the Liassic shales in the Weald Basin. Given the relative immaturity of the shale gas exploration industry resource estimates in both regions vary considerably. Current British Geological Survey estimates of recoverable resources are 2.7 tcm in the Bowland shale (the largest resource) and less than 1 tcm in the Weald basin (see [48]). Industry estimates are more optimistic. Two drilling tests conducted by oil and gas company Cuadrilla in the Bowland area suggest the gas in place in that area could be around 5.7 tcm, with 15–20% of resources in the Bowland shale deemed technically recoverable.

Of critical importance are the mineral rights regimes in place: the process of extraction licensing and its relationship to (surface) land ownership. In the US (under most circumstances) split estate laws separate the mineral estate from surface land owning rights, and the mineral estate represents the dominate tenant (in most states). The owner of the mineral estate has the right to occupy the amount of surface area necessary to extract the minerals, however, the mineral rights holder must pay the surface owner any damages.

In the UK the mineral rights regime for oil and gas differs, in that extraction rights are principally held by the Crown Estate in the UK, representing the interests of the reigning monarch – an archaic rule that presumes that land is owned by the Crown unless there is evidence to prove otherwise. The process of exploring and extracting these resources is governed by a system of national laws. Crown Estate is governed by a board of trustees charged with maintaining and improving the management and profitability of mineral resources. In the UK overall, governance of mineral rights extends out to the UK Continental Shelf (UKCS): an area comprising of those areas of the seabed and beneath the seabed, beyond territorial waters (up to a 12 mile limit), over which the UK exercises sovereign rights of exploration and exploitation of mineral resources [49]. Oil and gas rights have a slightly different governance regime to that of other mineral resources (including coal). Ownership of oil and gas within Great Britain was vested in the Crown by the Petroleum (Production) Act 1934, followed by The Continental Shelf Act 1964 applying the provisions of the 1934 Act to the UKCS outside territorial waters [49]. For onshore exploration a licence is required which grants exclusive rights to explore (i.e. drill boreholes) and then develop oil and gas onshore. The rights granted by a "landward licence" do not include any rights of access, and the licensees must also obtain any consent under current legislation, including necessary planning permissions from appropriate local authorities.

The UK government has publically expressed support for exploration, a political rhetoric of "going all out for shale gas", despite significant limits to the current scale of production. The former coalition government established the Office for Unconventional Gas and Oil (OUGO); the body responsible for 'encouraging and overseeing energy development in the UK'. The 2014–2015 Infrastructure Bill departs from the 2008 Planning Act and the 2011 Localism Act that aims to involve local communities in decisions which affect them by suggesting that more decision-making powers are returned to the Secretary of State in order for large-scale developments, particularly in the low-carbon energy sector. For local citizens, procedural justice is important in order to ensure that negative social, environmental and economic impacts from projects, which are commonly unevenly distributed geographically and governmentally, are not focussed upon them, and that "just outcomes" ([50]: 39) are negotiated. Some scholars have highlighted a number of unexpected outcomes that may result from shale gas reserve development which occur outside the influence of UK citizens and negatively affect them. These include property and investment issues such as impacts on property values, and the availability of property insurance and mortgages on properties located near to such activities [51]. As Goldthau [52] suggests, such 'above ground factors' are as important in the extractive industry as what occurs below ground, and has contributed to shale gas becoming the focus of a growing body of social science research. Researchers in the Netherlands have considered hydraulic fracturing as part of the country's energy transition, identifying the role of citizenship and the relational definitions of citizens to the state as part of this [53]. Hanschel and Centner [54] explore the issues concerning property rights in the context of hydrocarbon exploration utilising hydraulic fracturing in both Germany and the US, and report contrasting regulatory conditions and approaches which have led to shale gas development in each country progressing at different rates. Focussing on regulatory governance, the author identifies policy regimes, regulatory competition, regulatory path dependence and regulatory agencies as playing central roles in advancing and furthering our understanding of the governance challenges surrounding shale gas. Goldthau [52] also identify existing literature in this area that focusses on themes such as security, socio-economic impact and social contestations.

In the context of the UK, underground mineral resources are owned by the Crown Estate and the process of exploring and

extracting these resources is governed by a system of national laws. Recent changes to trespass law to enable oil and gas developers to access ground over 300 m beneath an individual's property have raised significant questions surrounding democracy, fairness, and such just outcomes, as the decision followed a public consultation on the matter which received an oppositional response from over 99% of those consulted [55]. Arguments for the decision included the mitigation of lengthy delays to exploratory activity, and costly and time-consuming legal processes resulting from public opposition activity. Within the DECC report on Underground Drilling Access [55], it is stated that the Government proposes to "give a statutory right of access" (p. 17) to geothermal energy and petroleum-extracting companies (includes shale and oil), as it does for coal operators, to extract below a depth of 300 m. More recently, the Government has stated that, as set out within draft regulations [56], hydraulic fracturing must take place at a depth below 1200 m below protected areas such as National Parks, Areas of Outstanding Natural Beauty, the Broads and World Heritage sites, and apparently qualifying this by stating that drinking water is not normally found at depths below 400 m [57]. In a comparative study, Hanschel and Centner [54] identify the contrasting statutory and regulatory provisions in Germany and the US. German citizens expect their government to exercise great caution and control when dealing with environmental risks from shale gas developments. The approach in the US is primarily focussed on the response to incidents and processes of compensation in the event of incidents and problems instead of "precautionary remedies in order to avoid potentially hazardous activities from the outset" (p. 155). Germany employ greater periods of consideration and deliberation of the benefits of shale gas development, whilst state legislation in the US which is supportive of developing shale gas resources has enabled drilling and development of the resource to proceed. At present, the approach of the UK has demonstrated elements of both of these approaches, with government support being explicit and a requirement for strict regulation and environmental awareness.

As Cotton [40] observes, social opposition to shale gas activities in the UK is compounded by regulatory and planning frameworks affecting shale gas developments, frameworks which are commonly complex and contradictory. At present, the process for regulation of shale gas in the UK involves operators competitively bidding for exclusive drilling rights, followed by the acquisition of landowner and local authority planning permission. Cotton notes that this has been recently controversial and problematic for exploration company Cuadrilla, in and around the Northwestern English city of Preston, where in June 2015 Lancashire County Council decided to reject several applications due to unacceptable impacts on 'the rural highway network and on existing road users' from increased HGV activity, 'the visual amenity of local residents', and 'an adverse urbanising effect on the open and rural character of the landscape' and 'industrialisation of the countryside' [58]. In response, Cuadrilla lodged four appeals to the Secretary of State in September 2015 against the decisions to refuse planning permission for their proposed exploration and monitoring sites, and also lodged an appeal with the Secretary of State in November 2015 against the Council's decision (taken in February 2015) to refuse the grant of planning permission for an existing site compound (Grange Road, Singleton) [59]. This latter appeal submitted by Cuadrilla Bowland Ltd was eventually allowed, and planning permission was granted for a period of three years under the Town and Country Planning Act 1990 [59]. According to the official inquiry website [60], as of July 2016, the Cuadrilla Public Inquiry report has been submitted following the closure of the Inquiry in March 2016, and has been sent to the Secretary of State for review.

Permission laws in the UK recently underwent further amendment, with changes being made to Trespass Laws under the newly amended Infrastructure Bill; it was previously stated by the UK Government that these were subject to "[a] full consultation on this policy and the legislation is entirely dependent on the outcome of that consultation" [11]. However, proposals to Trespass Law changes went ahead despite the vast majority of consultees objecting to the measures, thus creating the potential for significant democratic deficits akin to Swyngedouw's concept of post-political decision-making (see also [61,62]). Together, these facets have been subject to growing national-level debate on the political viability and public acceptability of shale gas risks and opportunities, prompting an urgent need for social scientific research into unconventional fuel-based energy policy development. As Cotton states ([40]: 1959):

> *"The competing rationalities and underlying environmental discourses... highlight the contested nature of the policy terrain and the lack of consensus on key social and governance issues"*

and also asserts:

> *"the need for government to provide broader, open dialogue on shale gas's place in energy policy in contrast to the current public consultation measures that have been heavily criticised as a means to justify a pre-determined policy outcome without sufficient deliberative democratic input".*

From our review of UK/US shale gas governance in this section, it would seem that the opportunities for the public to be involved in shale gas decision-making in the US are limited; frustrated by issues surrounding state level transparency of regulation and access to information. In the UK, a sluggish County level planning system frustrates industry and communities alike. As we have mentioned, Lancashire County councillors rejected planning consent for Cuadrilla's application to drill and frack a total of eight wells at two sites in Lancashire on the grounds that they would have an unacceptable visual impact and create too much noise. However, the company's appeals against these rulings look to take the decision *away* from local representatives to national government ministers and the Secretary of State. Rasch and Köhne [53] observe that negotiations about hydraulic fracturing in relation to energy transitions produce new forms of citizenship, as a result of inclusionary or exclusionary processes. Citizenship is considered "a process of negotiation between governments...and citizens...about who is included and excluded from participation in decision making processes" (p. 107). The authors claim that new alliances form at energy transition sites which blur traditional social categories, and state the importance of exploring how different people experience changes related to energy policy and of how they develop energy-related knowledge and practices. It was observed at Noordoostpolder in the Netherlands that citizens who felt excluded from participating in decision-making processes and accessing development-related information became politically active, participated in activism, demanded inclusion and coalesced with other citizen groups to access and share knowledge. We suggest that caution is taken in the UK case so that such exclusionary-based actions are mitigated and conflict be avoided.

We review the opportunities for participation in the US and UK in the next section. We also propose a system of participation based on procedural justice in energy decision making as an alternative to the current system.

4. Discussion: opportunities for public participation

The decisions made regarding the development of new energy infrastructure such as that required for shale gas are of local, national and international importance. We embrace the move towards a participatory-based form of dialogue in decisions rather than a technocratic 'top down', expert-led, 'one-way' form of con-

sultation. In this approach, dialogue is not only 'two-way', but multi-directional and dimensional, incorporating multiple stakeholders [63] and stakeholder groups [18]. This shift in the nature of the energy stakeholder-industry relationship in the UK has been documented by Whitton et al. [18]. Improved dialogue between industry and stakeholders can significantly impact upon the quality of decision-making [64], demonstrating a more democratic decision-making process. The literature supports democracy, in governance and society, to be a key theme of procedural justice in decision-making [65].

Following sustained academic critique, there has been increasing acceptance that broad public support for energy technologies cannot be based upon the tacit assumption of public trust in technical expertise and the assurances of developers. Planning and decision making processes that are technocratic frequently follow the Decide-Announce-Defend (D-A-D) strategy of expert assessment, closed decision-making, and public relations mechanisms of information provision to affected site communities, followed by an increasingly acrimonious battle against the social movements of opposition that inevitably emerge in response. Public engagement upstream of the decision point for siting controversial technologies is widely discussed [66,67], whereby heterogeneous publics are provided access and resources to engage in processes, by which they may form adequate personal opinions and preferences through informed deliberation and public debate on issues that may affect them. This is increasingly seen as something of a gold standard for dealing with technology-generated social controversy [68–70]. The concern presented by these authors, and echoed here is that there needs to be adequate public engagement in the processes of assessing both the social and ethical viability of shale gas as a fuel and a technological solution to energy security, climate change and economic growth (a participatory technology assessment process), and for siting new shale gas installations downstream at the point of siting actual fracking wells. If this is not observed, then decision-making will solely reflect the choices of central, institutional actors rather than those that are directly affected [71]. By looking across at the aforementioned case studies of other energy technology siting processes, it is clear that to do so would likely lead to public opposition, political controversy and eventual planning failure. The uncertainty of how local communities and impacted residents will influence the policy-making process surrounding shale gas has been identified by some to have produced barriers to the pro-fracking government policy in the UK transforming into a pro-fracking policy outcome [10].

We have highlighted the US regulatory systems' complexity, heterogeneity, lack of transparency, and limited local voice for US stakeholders. In the UK we have discussed how the concept of public engagement has become an institutionalised facet of energy technology development processes. However, numerous national case studies point to institutional failures to site controversial energy-related technologies in the absence of sufficient community-level participation in the planning process. So, where and how can the public engage on issues relating to shale gas developments?

4.1. ***Opportunities*** *for participation in the US*

Local participation and engagement is an area of on-going controversy and litigation in the U.S. For example, Pennsylvania's Oil and Gas Act essentially pre-empts the ability of local communities to regulate oil and gas activity. Although some municipalities passed ordinances limiting the location of oil and gas activity, those ordinances are still being adjudicated in the Pennsylvania court system, with their legal standing very much in question. Act 13 (passed in 2012) further limited the ability of local municipalities to regulate oil and gas activity, and included a statute that would forbid municipalities that have passed bans or moratoria on the activity from receiving their portion of the state's per-well impact fee distribution. This portion of Act 13 was ruled unconstitutional by the Pennsylvania Supreme Court, and is currently being reconsidered by lower courts. Denton, Texas recently passed a series of ordinances limiting oil and gas activity which are now the subject of pending legislation at the state level that would disallow such local regulations.

The main formal mechanisms for engagement in the US are public comment periods and hearings for proposed regulatory changes, and directly contacting legislators and regulatory agencies about general issues of concern. For example, the Marcellus Shale Advisory Commission was created through executive order of the Pennsylvania Governor in 2011. This body was charged with developing comprehensive set of recommendations for development of unconventional natural gas in the Commonwealth. During their deliberations, the Commission held 21 public meetings (at which there were opportunities for members of the public to speak) and invited contact through letters/emails from the public. The recommendations from this group formed the foundation for Act 13, passed in 2012, which updated the state's Oil and Gas Act in numerous ways. Two important elements of Act 13 were meant to increase transparency: an increase in the range of households (within 3000 ft. of a well) and municipalities (host plus all adjacent municipalities) to be notified of permit applications, and the requirement for companies to disclose hydraulic fracturing chemicals through the FracFocus.org website (earlier legislative changes required production reporting every 6 months, repealed the 5-year confidentiality of production reports, and required online reporting).

Another avenue for public engagement is the development and operation of task forces. At the height of development in Pennsylvania, there were approximately 12 counties that developed task forces, with varying levels of activity and engagement with the public. Members on these task forces were typically appointed by local political bodies (usually county commissioners) and served in an advisory capacity. The main activities of these task forces included providing educational opportunities for local residents, agency staff, and municipal officials; development of information and resources to for local economic growth (e.g., assessing availability of commercial property, industrial park development); opportunities to discuss and address issues of local concern (e.g., roads, safety, environmental impacts); and enhance communication with industrial representatives working in the area. As advisory bodies, however, the effectiveness of the task forces varied greatly, and has been influenced by the local cultural and political context in which they worked. Another model is the Eagle Ford Task Force, a multi-county body created by the Railroad Commission of Texas to coordinate activities in the 23-county play in south Texas [72]. The goals of the Eagle Ford Task Force were to engage the public and increase communication among stakeholders early in the development, to avoid the conflict witnessed in other regions. The effectiveness of the Task Force, and its ability to meaningfully engage with the public, remains to be evaluated.

Outside of these formal, institutional means for the public to participate in decision-making are approaches grounded in collective behaviour and social movement activity. Two avenues will be highlighted here. The first is the involvement of citizens, sometimes in partnership with local government or research institutes, to monitor the impacts of development themselves. Groups of citizens, such as watershed organizations and other environmental groups, have begun to collect or enhanced their efforts to collect data used to monitor the health of ecosystems affected by natural gas development [47,73–75]. Several organizations in the Marcellus region (e.g., FracTracker, Shale Network, SkyTruth) have collated that data and made the databases publicly accessible with the goal of enhanc-

ing public access to information and monitoring the impacts of development. For the most part, these organizations work in partnership or at least in parallel to public agencies. Another avenue has been the development of opposition groups as well as the use of "fracking bans" or local moratoria on oil and gas activity. The legal standing of these moratoria vary by state. The Community Environmental Legal Defense Fund has effectively used a community rights framework to develop and pass referenda in several jurisdictions.

A relatively new development has been the creation of third-party certification options, which would provide citizens with information about the practices used by participating production companies. This is a move to increase transparency and accountability and to develop a means to effectively assess the performance of companies across a range of environmental, health, safety, economic, and community outcomes. The Center for Sustainable Shale Development has developed a set of environmental "performance standards" to which companies must adhere to receive the certification primarily in the Marcellus Shale region. Similarly, Equitable Origin, a private certifying firm, has developed their EO100 standards (with draft revisions specific to shale oil and gas) meant to ensure performance across a range of indicators primarily in the Amazon basin. Both of these certification systems are intended as eco-labelling initiatives that provide more (and more accurate) information to enable those who purchase energy and those who contract with energy producers to make more informed decisions about the origins and implications of their products.

4.2. ***Opportunities*** *for participation in the UK*

Historically, a period of public consultation is considered by the United Kingdom (UK) Government to be the correct process in which to involve the public in the development of new policy and legislation [76]. The feedback received from the consultation informs the Government's decision making process, resulting perhaps in policy or legislative changes. When new plans are large-scale and considered controversial, a planning inquiry (with independent adjudication) is often the route taken to derive an outcome.

In the UK, the Government's Spending Round 2013 saw significant incentives being generated for shale gas exploration, including the announcement of industry tax breaks, a new regulatory framework, business rate cuts for local councils and community benefits packages for shale gas host communities [41] in order to create economic incentivisation at different scales of governance (for onshore oil and gas exploration companies, councils and affected site communities). The result was a stimulation in the applications for Petroleum Exploration and Development Licences (PEDL) from exploration companies with associated consultation. Some of these exploration efforts, such as those of Cuadrilla in the West Sussex town of Balcombe in Southeast England in July 2013, and iGas's exploration in Barton Moss in Salford, Greater Manchester, received significant opposition (i.e. public protests) and media attention. This was largely based on a perceived lack of opportunities for community consultation and public involvement on development activities and decisions, in addition to public concerns that regulatory bodies and elected officials were not sufficiently acknowledging and protecting constituents' interests in these communities [77,38]. Conversely, recent rhetorical shifts in the UK appear to demonstrate a move towards greater inclusion and participation of local populations. The recently published Shale Wealth Fund (SWF) consultation document, from the UK Government, argues that local populations should have more control in decisions that affect them, asserting that "the government believes in empowering local people, and wants to see communities and individuals have greater control of the decisions, assets, and services which affect them" [78]. The SWF is promoted as a fund which "could deliver up to £1 billion of funding" (p. 3) as a result of shale gas production efforts in the UK, with the SWF consultation document proposing that a portion of this funding could be directed towards local communities, thereby sharing "the benefits of shale developments" (p. 3). Such promotion of 'local participation in local decision-making' appears *prima facie* to contribute towards efforts to socially and politically legitimise UGD and enhance, using the terminology of Paydar et al. ([79]: 1), "the social feasibility of UGD". Within the document, the government's commitment to "ensuring that local communities are fully involved in planning decisions that affect them" ([78]: 3) is clearly stated. However, this is followed by the suggestion that necessary steps are being taken in order, "for all those affected by new development" (p. 4), to make the planning system "faster and fairer" (p. 4). Whilst this is termed in a positive tone in the document, we question the apparent contradiction of a system which is made fairer for those involved by providing them with *less* time to *be* involved. This is perhaps an example of where the UK government's turn away from the 'deliberative', noted by Whitton et al. [18] as the 'deliberative U-turn', and towards the more 'streamlined' or 'fast-tracked' approach to planning is demonstrated and where, in justice terms, the approach becomes increasingly problematic.

The SWF consultation document also posits that local residents will reap the benefits of shale gas recovery, and will also have an influence upon the governance of economic outputs from shale developments: ". . .the benefits of shale will go to local people first, and individuals and communities who host developments will be directly involved in the decision making about how the tax revenues from shale are spent" ([78]: 3).

This rhetoric of 'benefits for locals' and 'direct involvement' linked to shale gas decision-making raises numerous complex social, economic and political questions surrounding the governance of shale gas and the benefit-related outputs of production. Indeed, as Cotton [20] notes, "when looking at the decision-making control of local communities, we see a complex and contradictory politics of localism" (p. 14). We argue that one of the numerous approaches for beginning to understand this complexity in a legitimate sense is multi-stage dialogue with community groups to enhance the procedural justice of community engagement and decision-making. This assists the governance of such developments by working from a well-established base of understanding what specific communities prioritise and value.

One of the few shale-related processes in the UK on which there is published material is the decision-making process and administration for the SWF, at the local level, explored within the SWF consultation document [78]. The document briefly presents a number of decision-making-body options for consultation and comment, which include:

1. Utilising an existing, active body in the local community, such as a Parish or District Council, to administer funds. Councils may receive funds to then spend on specific objectives or to administer grants to funded projects.
2. Utilising an existing body already present and administering industry community benefits schemes.
3. Establish a new or independent decision-making body to administer local level funding.

It is noted that local community representation should be reflected by those selected as decision-makers, and that local residents should be "as directly involved in decision-making as possible" ([78]: 13). Whilst the level of detail in this document is limited, the emphasis on local participation in funding allocation and local spending decisions is apparent and proposed, and elements of procedural justice and democratic governance such as

participation, equity and representation are clearly suggested by the consultation document.

4.3. ***Incorporating*** *social justice into shale gas governance: a UK focus*

According to Thibaut and Walker [80], it is the belief of citizens that procedures hold importance, because "fair procedures produce fair outcomes" ([81]: 182). When we consider major infrastructure projects which produce multiple and often unknown outcomes and impacts upon societies, raising concerns surrounding social justice, notions of 'procedural fairness' and 'procedural justice' of the decision-making processes associated with these developments are important. For project developers, meeting procedural justice ideals with transparent decision making is an important factor in avoiding conflict with local populations [82]. In this sense, demonstrable justice and fairness during processes such as participation and decision-making can aid in increasing local support for a project. Where acceptance is not achieved, local opposition often exists, which is economically and socially costly to both developers and communities as it can result in planning delays and a loss of trust [83], of which the latter is notably difficult to retrieve. Rootes [84] has also shown how the absence of procedural justice can reveal how power relations between local actors may be imbalanced, which has ethical implications for decision-making policy making surrounding nationally significant infrastructure projects (NSIPs). We argue that the absence of demonstrable social justice within shale gas projects will likely lead to societal resistance and opposition, political critique, and the inability to be deemed as positive or 'good'. As Lebel et al. [85] state, the central goal of good governance is social justice, whereas Fung [86] describes social justice as a central value of democratic governance. In short, effective governance requires social justice at its core, and we argue that effective governance is required to achieve any sense of energy justice in relation to shale gas projects.

In the UK, a small number of exploration companies dominate shale gas exploration, one of which is Cuadrilla. Cotton, Rattle and Van Alstine [38] discuss procedural justice in the context of Cuadrilla's shale gas exploration activities in Lancashire, UK in recent years, concerning community benefit practices and community engagement with locally affected communities. Permitted site licenses which were obtained prior to Cuadrilla's exploration activities did not require Environmental Impact Assessments (EIAs). Due to these activities being exploratory as opposed to commercial, and being declared to cover an area under 1 ha [87], Cuadrilla's practices complied with the legal regulatory framework (Town and Country Planning Regulations 1999 in England and Wales), but were questionable in regards to their social acceptability. Cotton, Rattle and Van Alstine [38] observe that by avoiding the EIA, the company's practices avoided generating a social licence to operate (SLO), failing to produce any degree of "ongoing status of local stakeholder approval" (p. 433). Howard-Grenville et al. [88] highlight the importance of SLO due to the unintended consequences for industry, such as conflict, opposition and project delays, that may arise by ignoring or acting contrary to the expectations of local publics. There can also be regulatory consequences if regulatory authorities experience pressure from elected representatives to bridge this social gap and tighten regulatory conditions [14]. As this agreement with communities is not a legal requirement and is intangible, companies and industries may question its value or impact; however, Calvano [89] has shown that communities surrounding these developments can become sites of social conflict and political contestation. Cotton, Rattle and Van Alstine [38] note that gaining SLO requires establishing procedural fairness, by engaging communities in decision-making over site licensing, an observation also made by Gross [82]. However, the authors propose that Cuadrilla's communication with communities in Lancashire and Suffolk were insufficiently deliberative, and merely demonstrated 'deliberative speak' [90], communicative rhetoric which fails to ensure that communities are involved in decision-making and establish a SLO.

Recent proposals look to provide local authorities in the UK with monetary incentives, such as 100% business rates for extraction activities, which carry potentially negative implications for the impartiality of these bodies and may damage "the procedural environmental justice capabilities for councils to protect vulnerable constituents" ([38]: 434). At the present time, the recently re-formed Conservative government launched a consultation document on the Shale Wealth Fund (SWF) (see [78]), which provides details on how additional revenue could be provided to local communities, to populations affected by shale gas development sites, *beyond* funding provided by the shale gas industry [91]. Funding, incentives and community benefit packages are reported elsewhere as becoming a common characteristic of site selection strategies for other energy industries, such as nuclear, or more specifically nuclear waste management (see [92]). On the subject of revenues derived from shale gas developments, US-based research conducted by Paydar et al. [79] explores the association between local public support for unconventional gas development (UGD) and UGD-related public revenues disbursed to county and municipal governments. The authors find a positive correlation between the collection of 'impact fee' revenues and support for UGD projects, and importantly, that higher rates of public support were found to be associated with municipal-level payments than to county-level governments. Such findings have governance implications for the UK, in that it may be more socially acceptable and supported for revenue-based support to 'shale gas communities' to be managed at more decentralised, local scale, where communities and local institutions have greater influence on how development-related funds are distributed and utilised in their locality.

The SWF consultation in the UK aims to gather views on "how government can ensure that the communities and regions who host shale activity will experience significant, tangible and lasting benefits" ([78]: 5).The consultation document makes clear that those areas which produce shale gas through hydraulic fracturing should receive the various benefits which materialise as a result; the north of England is specified as the area of the UK with the greatest identified volume of shale gas, and indeed, this is where it is proposed the UK "are most likely to see the shale industry develop" ([78]: 7).

The government proposes that in addition to the funding framework previously proposed by UK Office for Unconventional Gas and Oil (OUOG), the shale industry body in the UK, local communities should receive financial payments generated from tax revenues from shale gas production. In a Community Engagement Charter produced by UK Onshore Oil and Gas [91], commitments are made on operators providing local communities with £100,000 per well site where hydraulic fracturing takes place (during the Exploratory Phase), whilst if the site progresses into commercial production (termed the Production Phase), 1% of total revenues will be made "available to provide benefits for the local community" ([78]: 5). It is proposed that additional funding from the SWF would arrive at a later stage than community funding provided by the shale gas industry, and that the profitability of each site would determine the degree of funding available to communities and regions 'associated' with each site; the initial proposal of the UK Government is to set a maximum funding threshold of £10m per site, the lifetimes of which are estimated to be 25 years [78]. On the theme of conceiving the SWF at the local level, the consultation document also seeks views on the notion of allocating funding from the SWF on an intracommunity basis; more specifically, by "directly allocating funding to households", potentially being realised, depending on the individual contextual characteristics of communities, in the

form of "a relatively small per-household payment" ([78][78]: 12). This reduces the scale of economic benefits beyond the community scale, and envisions the governance of economic benefits on a more disseminated and individualistic basis.

The government makes it clear in this document that funding from the SWF will be focussed unto those regions which act as hosts to shale gas developments and operations:

> *"the same regions that host shale developments will be those in which the benefits of the Shale Wealth Fund will be delivered"* ([78]: 7).

Communities that are geographically distant from shale gas sites, and therefore not deemed to be 'associated' or 'local' to shale gas sites, but are perceived by some to be 'impacted' by shale gas operations (e.g. by the transport of development-related resources and materials by heavy goods vehicles through or close to these communities) may suffer from this locally-targeted economic governance of 'shale gas benefits'. This has implications for the distributive justice of benefits provision from such developments. Whilst important, participation in decision-making is not enough for 'a just system' to be realised; justice requires both process and distributive aspects to be addressed and fulfilled. In a recent study by Cotton [20], the author applies an ethical framework for policy evaluation of shale gas in the UK, based on the work of Shrader-Frechette [93] which considers the interrelationship between the distributive and procedural elements of environmental justice. In applying this framework, Cotton emphasises the argument that government and industry organisations must address both procedural and distributional justice challenges to demonstrate that the decision-making process and outcomes respectively of such developments are ethically legitimate. Cotton argues that fracking-related planning policy development links to deeper problems of participative and consent-related injustice that relate to ongoing processes of planning reform (the Planning Act 2008, the Localism Act 2011 and now the Infrastructure Act 2015) that shorten decision times across multiple planning consent regimes, and remove powers from local communities for decision-making control by rescaling decisions from local to national scales. We contend that this has broader energy justice implications on the shale gas industry and its activities.

How do we respond to what we have identified thus far, and what do we propose in address of such observations? In the context of enhancing governance procedures, we propose that a systemic, participatory, community-led approach is required to achieve any sense of how participation that is procedurally just and fair can be defined, in a community setting and within the context of energy developments. Such an approach incorporates multi-directional dialogue, where local stakeholders are viewed as assets to utilise to improve and legitimise decision outcomes. This in turn contributes towards procedural justice as experienced by affected communities as stakeholders, and more broadly towards the energy justice exhibited by the technologically-based development. This is also facilitated by a move away from the technocratic D-A-D approach (Decide Announce Defend) toward the more democratic and collaborative E-D-D approach (Engage Deliberate Decide) of governance and decision-making. Whitton et al. [18] have previously proposed this type of approach with the aim of achieving a form of legitimacy that allows communities to derive social priorities through 'community visioning'. Community visioning is a process that enables different viewpoints to be understood through dialogue. Local people come together to identify and debate community values, to highlight both current issues and future opportunities, and then co-develop plans to achieve an agreed vision [94–96]. This approach promotes several critical elements, useful within the context of shale gas developments. The first is democracy in shale gas decisions; the manifestation of this being public involvement in energy decisions as part of the dialogue between government, industry and local communities. The second is that the process itself is evidence of a form of procedural justice in shale gas decisions that advances a concept of fairness. In this respect the question asked should be; "is the process perceived as fair, and is the outcome equitable?" This concurs with the suggested necessities of ethically legitimate decision-making, in both procedural and distributive contexts, as discussed by Cotton [20].

In terms of process, the approach is community led and asset based (using the skills and resources based in the community), using deliberation to generate community priorities. We aim to initiate a lasting change within communities through building social capital; focusing on community assets not deficits [97]. An example of this approach on a national scale is provided by Big Local Trust, the £220m, 15 year UK National Lottery programme to encourage voluntary action and community development to support communities to achieve their own goals. This decentralised governance structure sees funds spent according to the priorities and needs of local communities, as articulated by community members, an approach which we argue can inform the development of a socially just and ethically legitimate system of governance for shale gas developments.

The conceptual framework proposed by Whitton et al. [18] is based on the assumption that a diverse range of social priorities is held by various stakeholder and social groups and that this is representative of the wider community. We assert that considering 'the public' as a single, uniform entity is unhelpful in regards to effective engagement and instead recommend the involvement of social groups that already exist within communities and reflect its complexity and heterogeneity. By engaging with social groups, we identify and understand local priorities through dialogue. We highlight these priorities to those actors and decision makers involved in governance activities. As Pidgeon [98] states in relation to 'nuclear communities', there exists a wide range of views in these locales that represent a "diverse set of publics" (p. 2). We propose that a similar case is found in rural 'shale communities', encompassing a similarly mixed 'public' and range of viewpoints. We respond to research calls made by scholars such as Cairney et al. [10] who state that, as shale gas policy in the UK moves from the current 'tentative pro-fracking stage at the centre' (i.e. government) towards new local-scale developments, more information is required on "beliefs, preferences, and strategies of actors in devolved and local areas" (p. 17). We suggest that by understanding the range of priorities and preferences in such communities and developing 'priority profiles' for different social groupings, more informed, legitimate and sustainable decisions can be made within communities. This is a product of the employment of more considered, strategic engagement with, and involvement of, diverse publics, thereby contributing towards more sustainable governance.

5. Conclusions

We have outlined the development of the shale gas industry in the US and UK in terms of the developed and developing regulatory frameworks in each county. In addition, we have compared the opportunities that these systems of governance present the general public with opportunities to engage and become involved in shale gas decisions. We have discussed these in the context of social and energy justice, and have considered what both the US and UK cases reveal about the limitations of and opportunities in different governance approaches. Governance of shale gas developments in the US has been shown to facilitate and catalyse its development whilst providing limited opportunities for local residents to formally influence decisions and developments, with

hearings being the common forum of public participation, raising questions around how 'socially just' such an industry can be deemed. In the UK, the exploratory stage of activities means that a similar examination of opportunities to participate is not possible. However, the rhetoric of the SWF consultation document and recent court rulings in the north of England highlight the tone of the UK approach and government position in regards to participation, and what opportunities are 'fair' and 'right' for communities associated with shale gas sites to expect in regards to funding and participation in decision-making.

In both countries it is clear that despite engagement rhetoric and associated processes, the publics' influence on shale gas decisions is perceived to be minimal or not at all. In response to this we have proposed a conceptualised framework that aims to provide an approach to public engagement, based on a range of local priorities. The framework highlights notions of transparency, accountability and social and procedural justice as key components, to contribute to a methodology of effective and legitimate governance.

How these local priorities are incorporated into national shale gas decision-making is an area we need to develop further. In the US, opportunities exist via models such as the Eagle Ford Task Force who engage local stakeholders early in the development process to avoid conflict witnessed in other regions. It has been discussed by the authors elsewhere, regarding other energy scenarios [45], how the incorporation of local stakeholder views into, and the transparency of, decision-making process in the UK continues to be an area of tension and limited progress. The recent publication of the Shale Wealth Fund consultation document has articulated the position and 'commitment' of the UK Government on the participation of local communities in 'planning decisions that affect them', and for these communities to receive a share of the revenues generated by associated shale gas sites. This demonstrates, in part, that socio-economic justice is permeating the social discourse surrounding potential shale gas sites. The community visioning approach suggested by the authors has the potential to highlight the views and concerns of communities that are involved in these developments and should be of interest to citizens and policy makers alike. Our approach promotes engaging with different community groups, enabling the different experiences, attitudes and priorities of these groups to emerge and thereby reflect the social complexity and heterogeneity of communities. Cotton [40] echoes such sentiments, noting that the "social and environmental impacts of shale gas exploration are experienced differently by different social groups" (p. 1945).

We question whether social justice, and indeed energy justice, can be realised within the context of shale gas production if the institutional and rather inaccessible governance experience in countries such as the US is replicated in the UK. We also argue that without learning from such experiences, and ensuring genuine opportunities for participation and influence as part of a socially-informed approach to governance, facilitating articulation by stakeholders of what is prioritised and valued in their own communities, decision-making will not reflect local contexts and address the needs of impacted communities. This, according to recently published consultation literature, appears to be a sentiment which the current UK government understands, and one which we urge them to retain at the centre of their approach to shale gas governance.

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